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REMARKS

Claims 1-20 were pending in the present Application. Claims 1, 9, and 17 have been amended, leaving Claims 1-20 for further consideration in the present amendment.

It is believed that the amendments made herein may be properly entered at this time, i.e., after final rejection, because the amendments do not require a new search or raise new issues and reduce issues for appeal. No new matter has been introduced by these amendments. Support for the amendments can generally be found in paragraphs [0018] and [0031].

Reconsideration and allowance of the claims are respectfully requested in view of the above amendments and the following remarks.

First Claim Rejection Under 35 U.S.C. § 102

Claims 1-5, 7-13, 16, and 17-20 stand rejected under 35 U.S.C. § 102(b), as allegedly anticipated by U.S. Patent No. 6,319,809 to Chang et al. (hereinafter "Chang"). Applicants respectfully traverse.

To anticipate a claim, a reference must disclose each and every element of the claim. *Lewmar Marine v. Barient Inc.*, 827 F.2d 744, 747, 3 U.S.P.Q.2d 1766 (Fed. Cir. 1987).

Chang fails to anticipate independent Claims 1, 9, and 17 because Chang fails to disclose a process comprising, *inter alia*, removing air from the process chamber prior to subsequent exposure to photons as in Applicants' Claim 1, to radiation as in Claim 9, and to electromagnetic radiation as in Claim 17. In Chang, the ultraviolet irradiation is described a being preferably "performed in nitrogen or ozone rich environment." (see Chang, Col. 6, ll. 31-32). There is no disclosure that air is removed from the process chamber prior to exposure to the photons, or to the radiation or to the electromagnetic radiation. Moreover, there is no disclosure of exposing the substrate to a process effective to remove the contaminants without causing degradation of the low k dielectric layer, wherein the process comprises a step that involves exposure of the substrate to a process selected from the group consisting of a heat process, and/or a vacuum process, and/or an oxygen free plasma process, or combinations thereof as in Claims 1, 9, and 17.

These process limitations are in addition to the step of removing air from the process chamber.

Accordingly, the rejections of Claims 1-5, 7-13, 16 and 17-20 should be withdrawn since Chang fails to disclose all claim elements as is required to maintain a proper 102 rejection. .

Second Claim Rejection Under 35 U.S.C. § 102

Claims 1-5 and 7-20 stand rejected under 35 U.S.C. § 102(b), as allegedly anticipated by U.S. Patent No. 6,303,524 to Sharangpani et al. (hereinafter "Sharangpani"). Applicants respectfully traverse these rejections.

Sharangpani is directed to a method for curing low k dielectric materials. The curing process is employed to form the low k dielectric material.

Sharangpani fails to anticipate independent Claims 1, 9, and 17 because Sharangpani fails to disclose a process comprising exposing a low k dielectric layer, which is already cured, to, *inter alia*, photons as in Claim 1, radiation comprising a wavelength of about 150 nanometers to about 500 nanometers as in Claim 9, or electromagnetic radiation as in Claim 17. By definition, Sharangpani's "cure" process is very different from the claimed drying process. According to the American Heritage dictionary, to cure is "to prepare, preserve, or finish (a substance) by a chemical or physical process". In fact, the FTIR spectra shown in Sharangpani's Figs. 2A-F demonstrate the disappearance of a peak around 2200cm^{-1} as an indication of a fully cured film (Sharangpani Col 11, ll. 60-67 and Col 12, ll. 15-18). In contrast, a low dielectric material subject to the claimed drying process enables removal of contaminants such as water moisture through disappearance of peaks from about 3000-3400cm^{-1} and at about 1400cm^{-1} as shown in Fig. 2 of the Applicants' disclosure. Also, it should be noted that the pre-cure step disclosed by Sharangpani is a bake step that is employed to remove solvents employed in coating the monomers for initially forming the low k dielectric film (Col 7, 43-54, claim 3). These "solvents" or "dispersants" are different from those defined as contaminants such as the wet chemical strippers noted throughout Applicants' specification (see generally Applicants' paragraph [0007].

The claimed process is applied to stabilized films of low k dielectric materials as is

evidenced throughout the disclosure, and in particular, as explicitly referenced to in Example 1 as reproduced in part below.

> In this example, a porous doped oxide low k dielectric layer with a thickness of approximately 1 micrometer was spin coated onto a silicon substrate, **cured**, and exposed to ambient moisture. . . .
>
> **The substrate was <u>then</u> exposed to a UV radiation** having a broadband wavelength spectrum ranging from 220 to 400 nm.

(Applicants' specification at paragraphs [0032] and [0033]; emphasis added)

As discussed above, Sharangpani's process is directed to curing a film containing the low k dielectric monomers to form the low k dielectric. Once cured, the process is then stopped. As such, there is no disclosure of the claimed drying processes for removing contaminants. In particular, there is no disclosure of exposing the low k dielectric material to photons as in Claim 1 or to radiation comprising a wavelength of about 150 nanometers to about 500 nanometers as in independent Claim 9 or to electromagnetic radiation as in independent Claim 17, particularly in combination with the other steps required for contamination removal. In summary, Sharangpani discloses exposing monomeric coating materials to UV radiation to cure and transform the monomeric coating materials to the low k material. This is not the same as exposing the low k dielectric material to photons or to radiation comprising a wavelength of about 150 nanometers to about 500 nanometers or to electromagnetic radiation.

Accordingly, Applicants respectfully request withdrawal of rejections to Claims 1-5 and 7-17.

<u>Third Claim Rejection Under 35 U.S.C. § 102</u>

Claims 1, 2, 5-8, and 17-20 stand rejected under 35 U.S.C. § 102(e), as allegedly anticipated by U.S. Patent No. 6,452,275 and 6,559,045 to Chung (hereinafter "Chung"). Applicants respectfully traverse these rejections.

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Chung fails to discloses a process comprising exposing a low k dielectric layer, to, *inter alia*, photons, or electromagnetic radiation and effecting excitation, scission and/or fragmentation of contaminants contained within the low k dielectric layer.

Accordingly, the rejections of these claims should be withdrawn.

First Claim Rejection Under 35 U.S.C. § 103(a)

Claim 6 stands rejected under 35 U.S.C. § 103(a), as allegedly unpatentable over Sharangpani. Applicants respectfully traverse this rejection.

For an obviousness rejection to be proper, the Examiner must meet the burden of establishing a *prima facie* case of obviousness, i.e., that all elements of the invention are disclosed in the prior art. *In re Fine*, 5 U.S.P.Q.2d 1596, 1598 (Fed. Cir. 1988); *In Re Wilson*, 165 U.S.P.Q. 494, 496 (C.C.P.A. 1970); *Amgen v. Chugai Pharmaceuticals Co.*, 927 U.S.P.Q.2d, 1016, 1023 (Fed. Cir. 1996).

As discussed above, Sharangpani is generally directed to curing processes. The curing process generally includes curing monomers that are transformed to a low k constant dielectric material by initiating crosslinking and/or polymerization of the monomers (see Sharangpani, Col. 3, ll. 1-43). There is no disclosure or suggestion of further exposing the low k material to photons after it is cured.

Accordingly, the rejection of Claim 6 should be withdrawn for at least this reason.

Second Claim Rejection Under 35 U.S.C. § 103(a)

Claims 6, 14, and 15 stand rejected under 35 U.S.C. § 103(a), as allegedly unpatentable over Chang. Applicants respectfully traverse.

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Applicants respectfully assert that a *prima facie* case of obviousness has not been established against independent Claims 1 or 9 because Chang fails to teach or suggest a drying process comprising, *inter alia*, removing air from the process chamber prior to exposing the low k dielectric layer to photons or radiation as claimed by Applicants. Rather, Chang teaches and suggests that the irradiation is performed in nitrogen or ozone rich environment. As previously discussed, the use of the nitrogen rich or ozone rich environment does not equate to a process that removes air from the process chamber prior to exposing the low k dielectric layer to photons or radiation. The presence of air can detrimentally affect the dielectric material during radiation to photon exposure. Moreover, the fact that Chang teaches and suggests the use of ozone clearly indicates that Chang fails to appreciate the advantages of removing air.

It is also noted that Chang teaches the use of ultraviolet irradiation as a pre-treatment to avoid or reduce subsequent via poisoning (see Chang, at Col. 1, ll. 52-64, Col. 3, ll. 61-62, and Col. 6, ll. 10, 62-64). The Applicants teach "drying" and "contamination-removal" methods that dry and/or remove contaminants after the contaminants are introduced into the low k material, while not degrading the low k material. As such, the processes are markedly different from one another and occur at different stages in the integrated circuit manufacturing process. Also, it is noteworthy that degradation of the low k material will manifest itself in increased capacitance, while via poisoning usually manifests itself as increased resistance.

As all elements of independent Claims 1 and 9 have not been taught, these claims are patentable over Chang. Given that Claims 6, 14 and 15 each further limit and ultimately depend from one of these independent claims, they too are patentable. Accordingly, the rejection of Claims 6, 14 and 15 are requested to be withdrawn.

Claim Rejection Under 35 U.S.C. § 112, Second Paragraph

Claim 17 stands rejected under 35 U.S.C. § 112, second paragraph, as being indefinite because the term "and/or" includes alternative language. Claim 17 has been amended, which has now rendered the rejection moot. Accordingly, Applicants request the Examiner to withdraw the rejection of Claim 17.

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It is believed that the foregoing amendments and remarks fully comply with the Office Action and that the claims herein should now be allowable to Applicants. Accordingly, reconsideration and allowance are requested.

If there are any additional charges with respect to this Amendment or otherwise, please charge them to Deposit Account No. 06-1130 maintained by Applicants' attorneys.

Respectfully submitted,

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